

Renewable Energy Production Forecasting System

Objective:

The objective of this project is to build a machine learning-based system to forecast solar radiation using meteorological parameters like temperature, pressure, humidity, wind speed, and wind direction.

This prediction can help optimize the performance and planning of renewable energy systems, particularly solar panels.

Dataset Used:

- Dataset Name: SolarPrediction.csv
- Source: Kaggle

Features Used:

- Temperature (°C)
- Pressure (hPa)
- Humidity (%)
- Wind Direction (Degrees)
- Wind Speed (m/s)
- Target Variable: Radiation (kW/m²)

Model Chosen:

The XGBoost Regressor model was selected due to its superior performance with structured tabular data and ability to capture non-linear relationships. The model was trained using the selected features to predict solar radiation.

Performance Metrics:

To evaluate the model, the following metrics were used:

- Root Mean Squared Error (RMSE): Measures the average magnitude of the prediction error.
- R^2 Score (Coefficient of Determination): Represents how well the model explains the variance in the target variable.

Example Results:

- **RMSE:** ~164
- **R^2 Score:** ~0.73

Challenges & Learnings:

Challenges:

- Handling missing and noisy data from weather recordings.
- Feature selection to improve model accuracy.
- Choosing the right model and hyperparameter tuning.

Learnings:

- Understood the significance of weather parameters in solar energy forecasting.
- Gained experience in using XGBoost and evaluating regression models.
- Learned how to preprocess time-series/weather data effectively.
- Improved understanding of renewable energy trends and their data-driven forecasting.

Name:

- Harsh Patel (12202040501027)
- Dhyan Shah(12202040501023)